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## Extreme weather for crops: Too dry, too wet, and even ideal

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# Extreme weather for crops: Too dry, too wet, and even ideal

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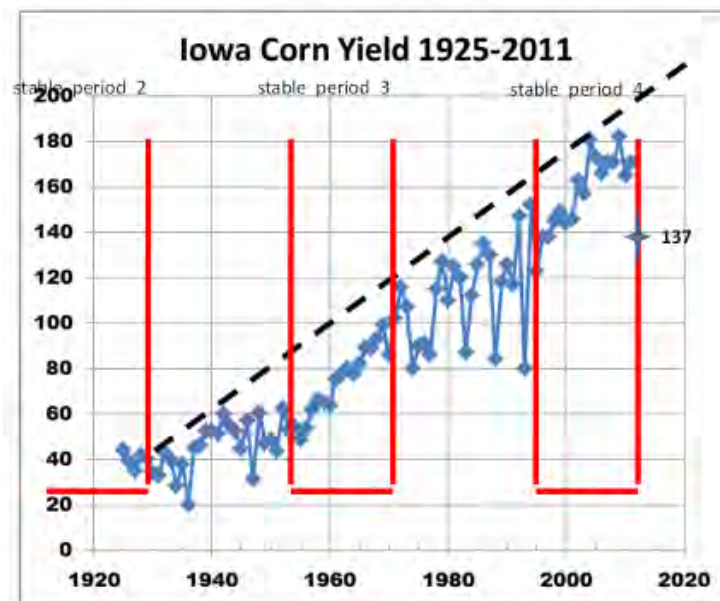
## Introduction

Corn yield per acre has been more erratic from 2001-2014 than was experienced from 1981-2000. The year to year volatility of soybean yield is similar to that of corn. The consistency of the pattern of favorable and adverse production years indicates that the management of “weather related risk” to production and marketing during the coming decade will likely be increasingly important to farm profits.

## Crop yield history

Records of corn yield in the United States date back into the mid-1800's. Most of the year to year variability of yields before the 1930's was caused by weather. A near linear yield improvement over time began with the introduction of hybrid corn. Iowa corn yield since 1925 is shown in Figure 1. Although the corn yield trend is nearly linear, the year to year deviation from the trend depends on the weather variability. Major shifts in hybrid technology have influenced the yield improvement, but the abrupt shifts in annual yield volatility match decadal scale weather trends rather than technical trends.

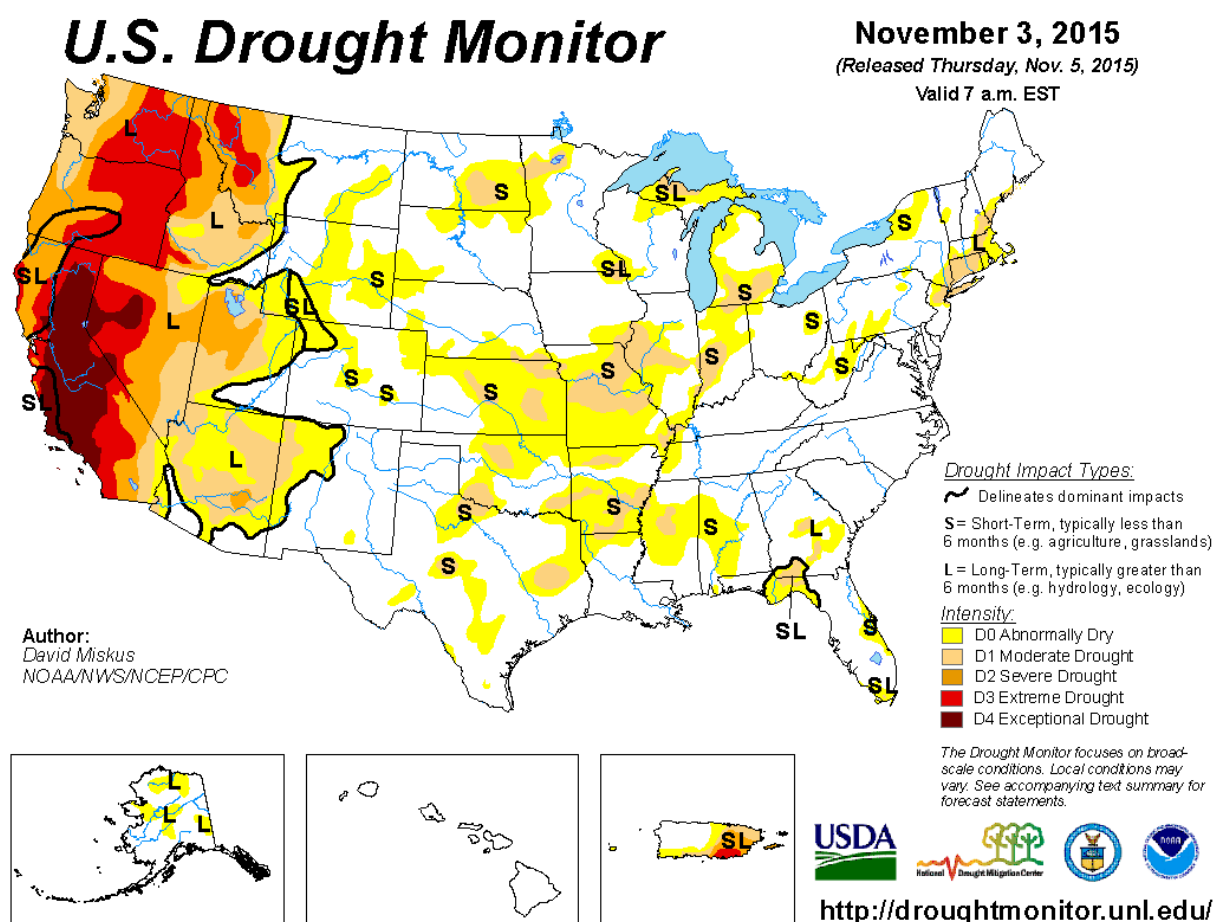
The record of four US crop cycles that include 18 years of consistent yields followed by 22 years of volatile extremes in production is not sufficient to conclude that a fifth cycle began in 2012. However, the management of risk that is associated with large deviations from trend-line yields should be given careful consideration during the coming decade.



**Figure 1.** Iowa corn yield as bushels per acre from 1925 through 2012. The dashed line shows the state yield that would be likely if weather conditions for the growing season are/were equivalent to the historically most favorable. Historically there have been 4 periods of consistent yields over an interval of 18 years. Also four 23 year intervals of extreme yield volatility have been observed (two such are shown). It is conjectured that the drought of 2012 (137BPA Iowa corn yield) ushered in the fifth period of extreme year to year yield volatility.

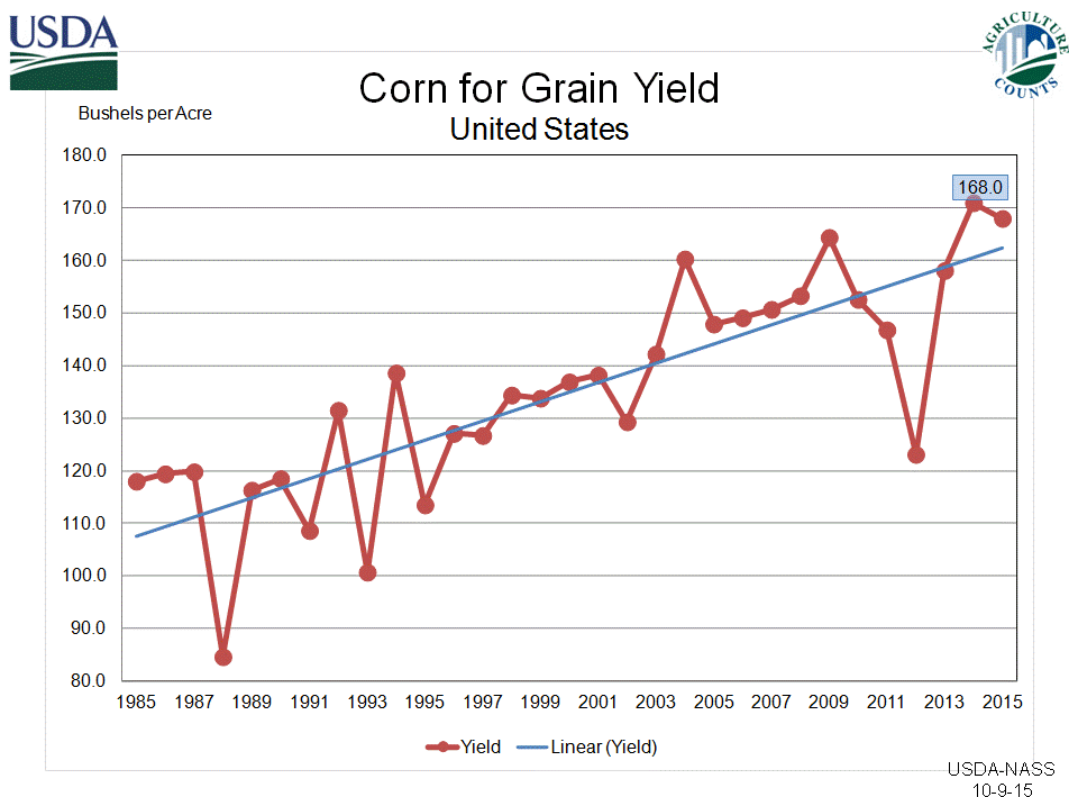
## Drought

Drought is defined in various ways. The US Drought Monitor currently defines five drought severity gradations: Abnormally Dry, Moderate Drought, Severe Drought, Extreme Drought, and Exceptional Drought. The lower intensity categories would likely result in a below trend corn yield, however very favorable temperature conditions may favor an anomalously high record high corn yield. The USDA Drought assessment is based on yield impact. When county crop yields are less than 90% of the trend a drought is legally recognized for the impacted county and all counties bordering it. Persistence of Extreme and Exceptional drought will usually decimate (reduce to 90% of expected or trend yield) a crop. Persistent drought is designated by “L” on the drought map (Figure 2).



**Figure 2.** The drought monitor gives a weekly update on the development and extent of drought conditions in the United States.

Wide spread drought experienced in 2012 was the first for the US Corn Belt since 1988. The drought began in the southeastern US and moved to the south central in 2011, then to the Corn belt states in 2012. The drought pattern, including the dryness in California was associated with the 2<sup>nd</sup> strongest La Niña on record and was not unlike the severe drought years of the mid-1950s associated with the strongest La Niña on record (Figure 3).



**Figure 3.** Two Midwest droughts during the past 30 years (1988 and 2012) were both associated with La Niña. In 1987 an El Niño shifted abruptly to La Niña bringing serious drought to the Southeastern US in 1987 and to the Corn belt in 1988. In 1993 crops suffered from floods between to record high corn yield years (1992 and 1994) that were marked by cool midsummer nights. The 2010-2011-2012 La Niña was the second strongest on record and serious 2010- 2011 drought developed in the Southeastern US and developing into the Corn belt drought of 2012.

Source: [http://www.nass.usda.gov/Charts\\_and\\_Maps/graphics/cornylid.gif](http://www.nass.usda.gov/Charts_and_Maps/graphics/cornylid.gif)

## Outlook

The Midwest outlook for 2016 is mixed. Year-end conditions in 2015 give a favorable indication of conditions going into 2016. Soil moisture in the Midwest was generally favorable for harvest in 2015 and still had reasonable moisture reserve at depth to move into the 2016 growing season. The El Niño event of 2015 was strong and indications of persistence into the 2016 growing season are encouraging. However, strong El Niño events have been notorious at stopping abruptly. During El Niño there is a 70% chance that the Corn Belt production of corn and soybean will both exceed the trend. A rapid shift from El Niño to La Niña in 1983 brought mid-season stress and resulted in a serious drought.

The current El Niño event appeared to peak in October. Historically an El Niño does not weaken and shift totally when the North Pacific Ocean is warmer than usual. This gives the agricultural community reason to hedge bets on the 2016 outlook for both corn and soybean. The producer should be well prepared to shift marketing plans for an above trend yield to the possibility of a sudden shift to below trend line production. During the first week of each month the assessment by Dr. Wolter has been of great value to producers: <http://www.esrl.noaa.gov/psd/enso/mei/>